limiting factor for the crystal growth cannot now be determined.

Because aspartic acid is usually the most abundant residue in the SM of several kinds of molluscan shells (CRENSHAW, 1972; WEINER & HOOD, 1975; WEINER, 1979; NAKAHARA *et al.*, 1982), this acidic amino acid has been assumed to be one of the most important components involved in shell formation. WEINER (1979) and WEINER & TRAUB (1981) suggested that the SM may form a two-dimensional sheet with regularly spaced carboxyl groups of aspartic acids on the surface. This precise spatial arrangement of the carboxyl-groups may react with Ca^{2+} ions and promote the nucleation of crystals of $CaCO_3$. DEGENS (1979) presented a similar idea in relation to the role of the SM. As in the previous data, which were based on the measurements made on the unfractionated matrix, aspartate was usually the most abundant residue in the purified Ca-binding glycoproteins, except in the complex and crossed-lamellar layers. However, the amount of aspartate showed distinctive variations according to the ultrastructure of the shell. The most distinctive difference was between the nacreous and prismatic layers, and the homogeneous, composite-prismatic, complex, and crossed-lamellar layers. This result could imply different functions of the glycoproteins in the process of shell formation. In the foliated and chalky layers, aspartate was present in high amounts but serine was also highly concentrated. Serine is generally recognized to be present mostly as phosphoserine (BUTLER, 1987). WHEELER *et al.* (1988) demonstrated that such phosphorylation of the matrix may be significant for regulating the morphology of carbonate. The amino acid compositions of the organic matrix may also depend on various environmental factors to which mollusks are subjected. From the results of a comparative analysis on the unfractionated matrix, DEGENS *et al.* (1967) showed that amino acid compositions of the matrix are correlated with environmental factors. DUSSART (1984) also reported that the amino acid compositions of the shells of 13 species of freshwater Bivalvia reflected phylogenetic affinity but that environmental factors were probably important. Samata (unpublished data) has also pointed out the slight difference in the amino acid compositions of the Ca-binding glycoproteins in the nacreous and prismatic layers between the marine and freshwater species of Bivalvia. The difference was most remarkable with respect to the levels of aspartate.

The compositions of the Ca-binding glycoproteins in the nacreous and prismatic layers of *Nautilus pompilius* were slightly different from those in the same layers of the species of Gastropoda and Bivalvia, and also from those in the other shell layers. *Nautilus* is distributed in fairly deep waters in tropical seas, whereas the other species examined are restricted to shallow waters. The unique habitat of *Nautilus* makes it difficult to determine whether the difference in amino acid composition can be accounted for by environmental or phylogenetic factors.

The amino acid composition of the Ca-binding glycoprotein in the composite-prismatic layer was clearly different from those of the nacreous, prismatic, and foliated layers. The composite-prismatic layer was first defined by BØGGILD (1930) and has been considered to be a subdivision of the prismatic layer by some later investigators (CARTER, 1980; UOZUMI & SUZUKI, 1981). KOBAYASHI (1968) noted that the ISM in this layer resembled that in the complex and crossed-lamellar layers both morphologically and histochemically, but differed from that in the nacreous and prismatic layers. Moreover, because the mollusks that contain this layer are taxonomically close to those that contain the homogenous, complex, and crossed-lamellar layers, the composite-prismatic layer may be closely related to these three shell layers.

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THE VELIGER

A New Species of the Genus *Cyerce* Bergh, 1871, from the Cape Verde Islands (Opisthobranchia: Ascoglossa)

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Abstract. *Cyerce* ***verdensis*** Ortea & Templado, sp. nov., is described from the Cape Verde Islands (eastern Atlantic). The presence of papillae on the rhinophores, pericardium, and cerata is the main differential feature of this new species. The Atlantic species of the genus Cyerce are listed and discussed.

INTRODUCTION

In a recent paper (Ortea & Templado, 1988) a new species from Cuba, *Cyerce habanensis,* was described, and the Atlantic species of this genus were discussed. At the same time, Thompson (1988) described another new species of this genus from the Saronic Gulf, *C. graeca,* in one of his works on eastern Mediterranean opisthobranchs. Following his advice on the necessity of further studies on this genus, we describe here another new species of *Cyerce* from the tropical eastern Atlantic, collected during the "Primera Expedición Científica Ibérica al Archipiélago de Cabo Verde" (August of 1985).

Family Caliphyllidae Thiele, 1931

Genus *Cyerce* Bergh, 1871
= *Lobifera* Pease, 1866
= *Lobiancoia* Trinchese, 1881

Cyerce ***verdensis*** Ortea & Templado, sp. nov.

(Figures 1–3)

Material: One specimen (Figures 1–3), 16 mm in length (18 August 1985), and four others 13, 12, 10, and 5 mm in length (20 August 1985), all collected between 0 and 2 m deep on *Halimeda* sp., in Salamança Bay (16°54′N, 24°57′W), San Vicente Island, Cape Verde Archipelago.

The largest specimen has been chosen as holotype, and deposited in the Museo Insular de Ciencias Naturales, Tenerife, Canary Islands (catalogue number MO/0092). The four paratypes are in the malacological collection of the Museo Nacional de Ciencias Naturales de Madrid, Spain (catalogue number 15.05/1033).

Etymology: Named after the Cape Verde Islands.

Description: The general body color of the animal is pale ochre. The dark brown digestive gland, which can be discerned clearly through the skin, is divided into two main branches that almost reach the posterior part of the dorsum. Each branch ramifies towards the cerata, without extending into them (Figure 1).

The foot is light in color, almost semi-translucent. Its frontal margin is rounded and a transverse mesopodial groove is present in the anterior one-third (Figure 2A).

The brownish pericardium has granulose white papillae. Such small papillae are present all over the dorsum. The bulky anal papilla is situated just before the pericardium, somewhat to the right of the median plane.

The rhinophores are split and inrolled. They have a disperse, brown and white pigmentation. Granulose papillae of a pale creme color are present on their distal half. The oral tentacles, also inrolled, are translucent with some white dots.

The leaf-shaped cerata are translucent with their distal margins angulose owing to some small white granules. Papillae, white granules, and superficial red-brown specks are present on both sides of the cerata (Figure 2B, C).

The radula of the 16-mm long specimen has 10 teeth in the ascending series and 13 in the descending one. The ascus contains more than 100 cluttered teeth. The functional teeth reach up to 80 μm in length at the beginning of the descending series. They are elongate and exhibit 12 denticles on both cutting edges. The protuded median zone of each tooth has two blunt protuberances (Figure 3B).

The penis is armored with a small nail-like spine that measures 10 μm in length (Figure 3A).

Discussion: In a former paper (Ortea & Templado, 1988) we have already discussed the Atlantic species of this genus. *Cyerce* ***verdensis*** clearly differs from all these by the presence of granulose papillae all over the dorsum, rhinophores, and cerata. Such papillae are lacking in the other species. The disposition of the papillae in the cerata resembles *Polybranchia viridis* (Deshayes, 1857), previously collected in the Canary Islands (Ortea, 1981). This latter species reaches 55–70 mm in length, and its juveniles are easily confused with *C.* ***verdensis*** at first sight. However, *P. viridis* lacks a transverse mesopodial groove and the diverticula of the digestive gland extend into the cerata.

The radular teeth of *Cyerce* ***verdensis*** are shorter and wider in proportion compared to those of *C. cristallina* and *C. antillensis,* and similar to those of *C. graeca* and *C. habanensis.*

Cyerce edmundsi Thompson, 1977, from Jamaica, also exhibits some pearl-like white glands in the distal margin of the ceras. However, the lack of a transverse mesopodial groove and the diverticula of the digestive gland in the cerata suggests that it belongs to another genus. Marcus (1982) and Jensen & Clark (1983) commented that *C. edmundsi* could be a junior synonym of *Mourgona germainae* Marcus & Marcus, 1970.

The fact that all the specimens of *Cyerce* ***verdensis*** were found on the chlorophyte *Halimeda* sp. suggests that this seaweed constitutes its food. We previously reported another species of this genus, *Halimeda opuntia,* as the probable food of *C. habanensis* (Ortea & Templado, 1988).

Including the present paper, the Atlantic (including Mediterranean Sea) species of the genus *Cyerce* are the following:

—*C. cristallina* (Trinchese, 1881). Mediterranean and Caribbean Sea.
—*C. antillensis* Engel, 1927. Caribbean region.
—*C. graeca* Thompson, 1988. Eastern Mediterranean (known from the Saronic Gulf only).

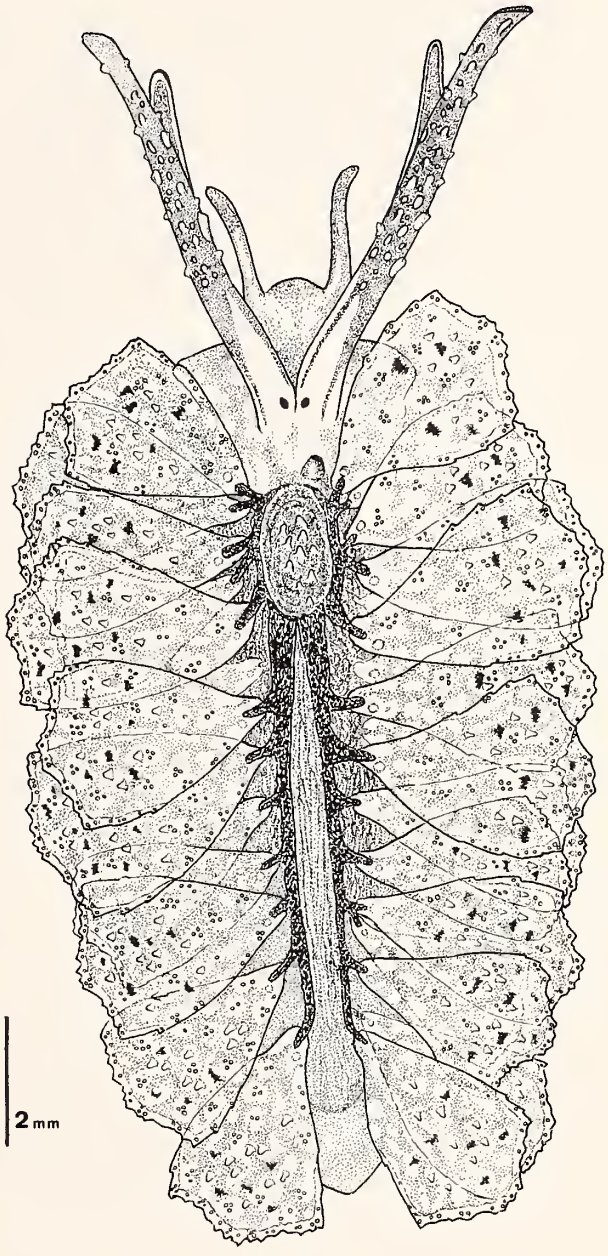

Figure 1

Cyerce ***verdensis*** Ortea & Templado, sp. nov., dorsal view of holotype.

—*C. habanensis* Ortea & Templado, 1988. Caribbean region (known from northern Cuba only, but the species cited by Marcus & Hughes (1974) as *C. antillensis* in Barbados might be this species).
—*C.* ***verdensis*** sp. nov. Cape Verde Islands (eastern Atlantic).

This last species is the first one of the genus which has been recorded from the eastern Atlantic Basin outside of the Mediterranean Sea.